REMARKS

This Amendment responds completely to the outstanding Office Action mailed February 2, 2004. Each of claims 1-18 is amended hereby to place the application in the condition for allowance. For that matter, applicants express their appreciation to Examiner Azarian for the indication of the allowability of dependent claims 8, 9, 11 and 14. Applicants, however, believe strongly in the patentability of independent claim 1, from which claims 8 and 9 depend, and independent claim 10, from which claims 11 and 14 depend.

Response To Rejections Under 35 USC § 102

Claims 1-5, 10, 12-13, 15, 17 and 18 were rejected under 35 USC § 102(b) as anticipated by US Patent No. 5,602,896, to Diepstraten. The Examiner asserts that Diepstraten discloses an image composed of sub-images, which includes a device comprising a plurality of sub areas (T1 to Tn) for forming an image (col. 5, lines 45-57, the first and second sub-images are used), a detector including a plurality of sensor elements for generating image data, read-out units (V1 to Vn) associated with each sub-area of the image (Fig. 1, col. 6, lines 16-34) refer to optical image and image sensors 2, 3 supply an electronic sub-image signal representing a brightness value, an analysis unit (12) arranged to evaluate image data from adjoining image areas (S 63 and S66 of neighboring sub-areas (T1 and T2) and to generate correction data, and a correction unit (13) which is arranged to correct incorrect image data by means of correction data (col. 6, lines 34-7), evaluate sub-image brightness by the sensors and correction unit for correcting the image signal.

Applicants respectfully disagree that Diepstraten anticipates its claims 1-5, 10, 12-13, 15, 17 and 18.

Applicants' independent claims essentially set forth at least a method, apparatus, or computer program all utilize a special device for a flat dynamic X-ray detector for the correction of images that contain defects. Such X-ray detectors are used for X-ray examination apparatus in the medical diagnostic field, where it is very important that the images produced are free from artefacts to a high degree. Known dynamic X-ray detectors are subdivided into a plurality of sub-areas, a respective read-out unit being used for each sub-area. Each sub-area comprises a plurality of image areas. A read-out unit amplifies the detected signals or image data of a sub-area; one read-out unit then reads

the plurality of image areas of a sub-area. Neighboring image areas that are situated at the edge of adjoining sub-areas, therefore, are read out by different read-out units. The inherently different amplification behavior of such different read-out units gives rise to abrupt gray scale transitions between such neighboring image areas. Such abrupt gray scale transitions appear as stripes in the image to be formed.

Applicants independent claim 1 sets forth a device for forming an image, which comprises a plurality of sub images. The device includes a single-surface detector with a plurality of sensor elements for generating image data, which are arranged in groups to form a plurality of sub-areas (T1 to TN), where each sub-image corresponds to each sub-area, read-out units (V_1 to V_N) which are associated with the sub-areas (T_1 to T_N) of the image, an analysis unit arranged to evaluate image data from adjoining image areas (S_{63} and S_{66}) of neighboring sub-areas (T_1 and T_2) and to generate correction data, and a correction unit arranged to correct incorrect image data by means of correction data.

Applicants' independent claim 10 sets forth a method of forming an image using image data acquired from a plurality of sub-areas (T_1 to T_N) of a flat dynamic x-ray detector, wherein a read-out unit (V_1 to V_N) is associated with each sub-area, wherein the image data from adjoining image areas (S_{63} and S_{66}) of neighboring sub-areas (T_1 and T_2) is evaluated in order to mitigate differences between amplifier characteristics.

Applicants' independent claim 17 sets forth an X-ray examination apparatus which includes an X-ray source for emitting X-rays and for forming an X-ray image, a flat dynamic X-ray detector for forming an optical image from the X-ray image, which detector includes sensor elements arranged in rows and columns and at least two amplifiers (V_1 to V_N) for reading out detected image data, at least one amplifier being associated with each of a plurality of sub-areas (T_1 to T_N) in order to read out detected image data. The apparatus includes an analysis unit for forming correction data on the basis of the evaluation of image data from adjoining image areas (S_{64} and S_{65}) of neighboring sub-areas (T_1 and T_2), and a correction unit for correcting the incorrect image data by means of the correction data.

Applicants' independent claim 18 sets forth a computer program for the correction of image data of an image comprising a single-surface detector having a plurality of sub-areas (T_1 to T_N), wherein a respective read-out unit (V_1 to V_N) is associated with sub-areas (T_1 to T_N) of the image

and image data from image areas (S_{64} and S_{65}) of adjoining sub-areas (T_1 and T_2) of neighboring read-out units (V_1 and V_2) is evaluated by formation of histograms in order to generate correction data after integration of the histograms, which correction data is used to adapt the image data from one sub-area (T_2) to the amplifier characteristic of the read-out unit (V_1) which amplifies the adjoining sub-area (T_1).

Diepstraten (WO 96/19893) discloses an image pick-up apparatus including that first and second sub-images are used as the first and the second reference image, respectively, for the calculation of the column and line gain factors, the column and line gain factors being calculated from brightness values of the first and second sub-image. More specifically, the image signal comprises two sub-images, formed in a combination unit. A correction unit is provided so as to correct differences in the sub-images. To this end, brightness values of columns of a first sub-image are multiplied by a column amplification factor and brightness values of rows of a second sub-image are multiplied by a row amplification factor. The amplification factors are derived from reference images and are stored in a memory.

Diepstraten's image sensors 2,3, are described as CCD sensors comprising a large number of photosensitive elements positioned relative to the beam splitter so that pixels in the optical image which are imaged on photosensitive elements of the one image sensor are imaged in intermediate spaces between photosensitive elements of the other sensor (implying separate sensors at two distinct positions in space, as shown in the figures). Diepstraten does not teach or suggest a device for forming an image from a plurality of sub-images, including a single-surface detector with sensor elements for generating image data, the elements arranged in groups to form sub-areas corresponding to each sub-image, read-out units for each sub-area, an analysis unit to evaluate image data from adjoining image areas of neighboring sub-areas to generate correction data, and a correction unit for correcting the image using the correction data.

Accordingly, independent claims 1, 10, 17 and 18 are not anticipated by Diepstraten under 35 USC § 102, and applicants respectfully request withdrawal of the rejections to independent claims 1, 10, 17 and 18 based thereon. Furthermore, because dependent claims 2-5, 13 and 15 depend from said patentable independent claims, applicants respectfully assert that those dependent claims are also patentable under § 102 in view of Diepstraten for at least the reasons set forth for the

patentability of the independent claims, and accordingly request withdrawal of the rejections of same.

Response To Rejections Under 35 USC § 103

Claims 6-7 and 16 were rejected under 35 USC § 103(a) as obvious by Diepstraten in view of US Patent No. 5,946,407, to Bamberger. The Examiner asserts, with respect to claim 6, that Diepstraten is silent about cumulative histograms, Bamberger teaches that cumulative histograms are logarithmic the look up table which transforms the gray level values of digital image in the region of interest (col. 10, lines 39-50), and that it would have been obvious to modify Diepstraten's sub-image invention according to the teaching of Bamberger because Bamberger provides a plurality of image enhancement features including gray scale stretching, contrast enhancement based on histogram equalization which improves visualization of suspected lesions and cost and risks of more tests which may be implemented by x-ray. With respect to claim 7, the Examiner asserts that Diepstraten teaches a histogram generator arranged to receive image data and to generate histograms over a selectable period of time (col. 3, lines 65 through col. 4, line 8, correction of brightness in short period of time) and that claim 16 recites similar limitations as did claims 1 and 6.

Applicants respectfully disagree. In particular, Diepstraten is art under 102(e), 102(f) or 102(g), and therefore cannot be used against claims 6, 7 and 16 in view of Bamberger to establish an obviousness rejection under 103(a), in accordance with applicants' understanding of 35 USC § 103(c). Applicants request, therefore, that the rejections based on Diepstraten in view of Bamberger be withdrawn, and claims 6, 7 and 16 pass be allowed.

Alternatively, even if Diepstraten were not commonly owned at the time of applicants' invention, or that section 103(c) is found not to be applicable to applicants' instant circumstances, the Bamberger/Diepstraten combination would still not render claims 6, 7 and 16 unpatentable under 103(a) for at least the following reasons. That is, Bamberger teaches a method and system for diagnosing living tissue, where a diagnostician may view digitized images of the tissue. The Bamberger user selects desired portions of an image and enhance same by use of an image enhancement feature. The image enhancement features include any combination of gray scale stretching, contrast enhancement based on logarithmic histogram equalization, spot enhancement and magnification.

Bamberger is not directed to forming an image, which comprises a plurality of sub images. The device includes a detector with a plurality of sensor elements for generating image data, which are arranged in groups to form a plurality of sub-areas (T1 to TN), where each sub-image corresponds to each sub-area, read-out units (V_1 to V_N) which are associated with the sub-areas (T_1 to T_N) of the image, an analysis unit arranged to evaluate image data from adjoining image areas (S_{63} and S_{66}) of neighboring sub-areas (T_1 and T_2) and to generate correction data, and a correction unit arranged to correct incorrect image data by means of correction data, as is applicants' independent claims.

Applicants respectfully assert that there is no teaching or suggestion in either Diepstraten or Bamberger for combining the two references. And even assuming arguendo that the two references could be combined, such combination would not realize applicant's inventions as claimed. That is, combining Bamberger with Diepstraten does not realize an invention such as those set forth in applicants' claims 6, 7 and 16, for at least the reasons set forth above with respect to the patentability of the independent claims in view of Diepstraten. Accordingly, applicants respectfully request that the rejection of claims 6, 7 and 16 in view of the Diepstraten/Bamberger combination under 103(a) be withdrawn.

In conclusion, applicants request allowance of claims 1-7, 10, 12, 13 and 15-18, over the art of record, and passage to issue of this application including all of pending claims 1-18.

Respectfully submitted,

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